Professional Development Series

INFORMED INFRASTRUCTURE

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The magazine for civil & structural engineers

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StormTrap®
MODULAR CONCRETE STORMWATER MANAGEMENT

Presented by:

City of University Park, TEXAS
Committed to Excellence

HUITT-ZOLLARS

Reducing Flood Risks in Older, Established Neighborhoods - Master Planning and Detention

May 19, 2021

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Introduction

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City Engineer
City of University Park

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Water Resources Engineer
Huitt-Zollars

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Project Manager
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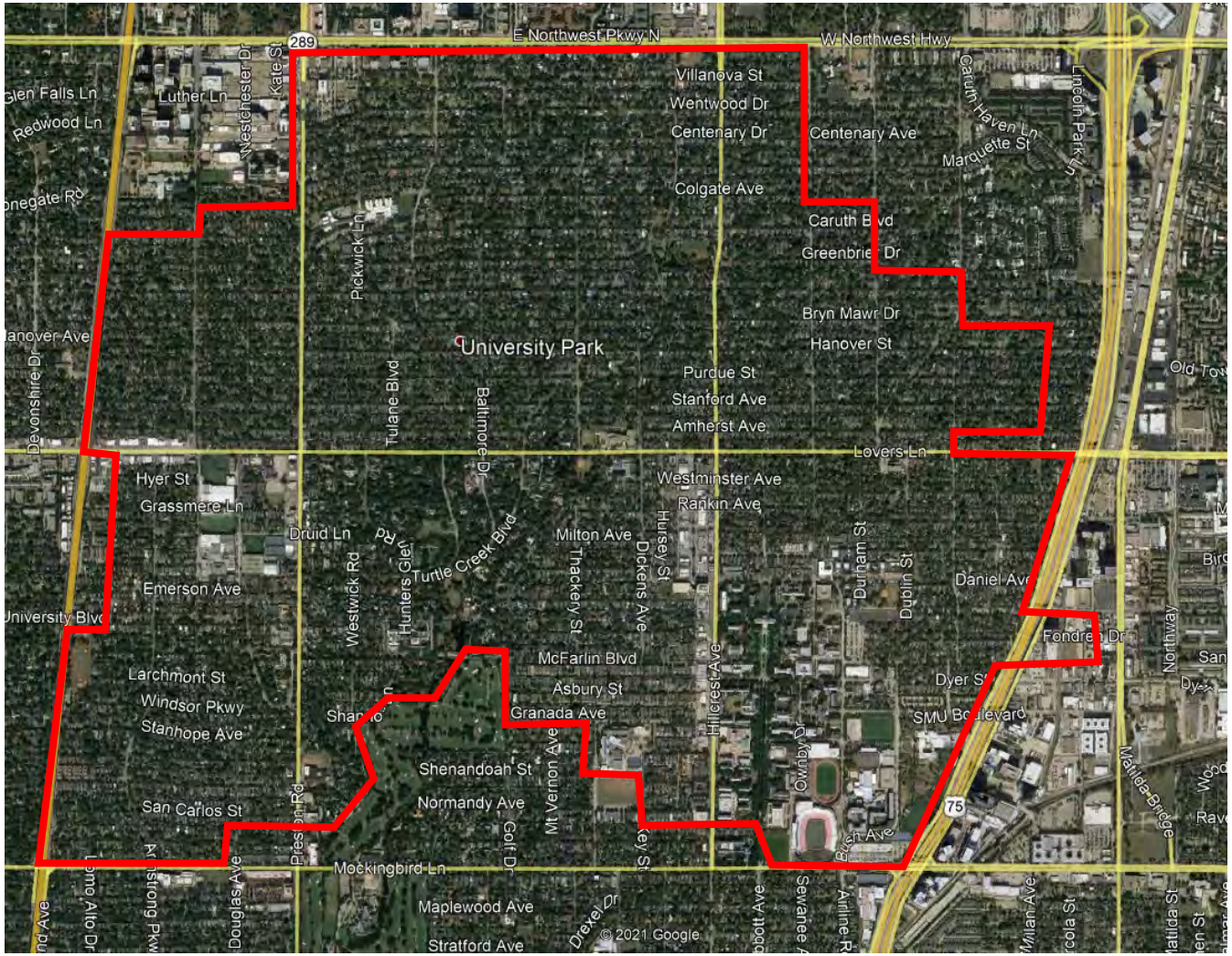
Agenda

- City Drainage Overview
- Community Needs and Project Goals
- Stormwater Master Plan
- Advanced Project Area – AOI 1
- Mitigation Solutions
- Construction Plans Development
- Construction Phase
- Project Completion
- Key Steps to Success – City's Perspective
- Time Lapse Construction Video

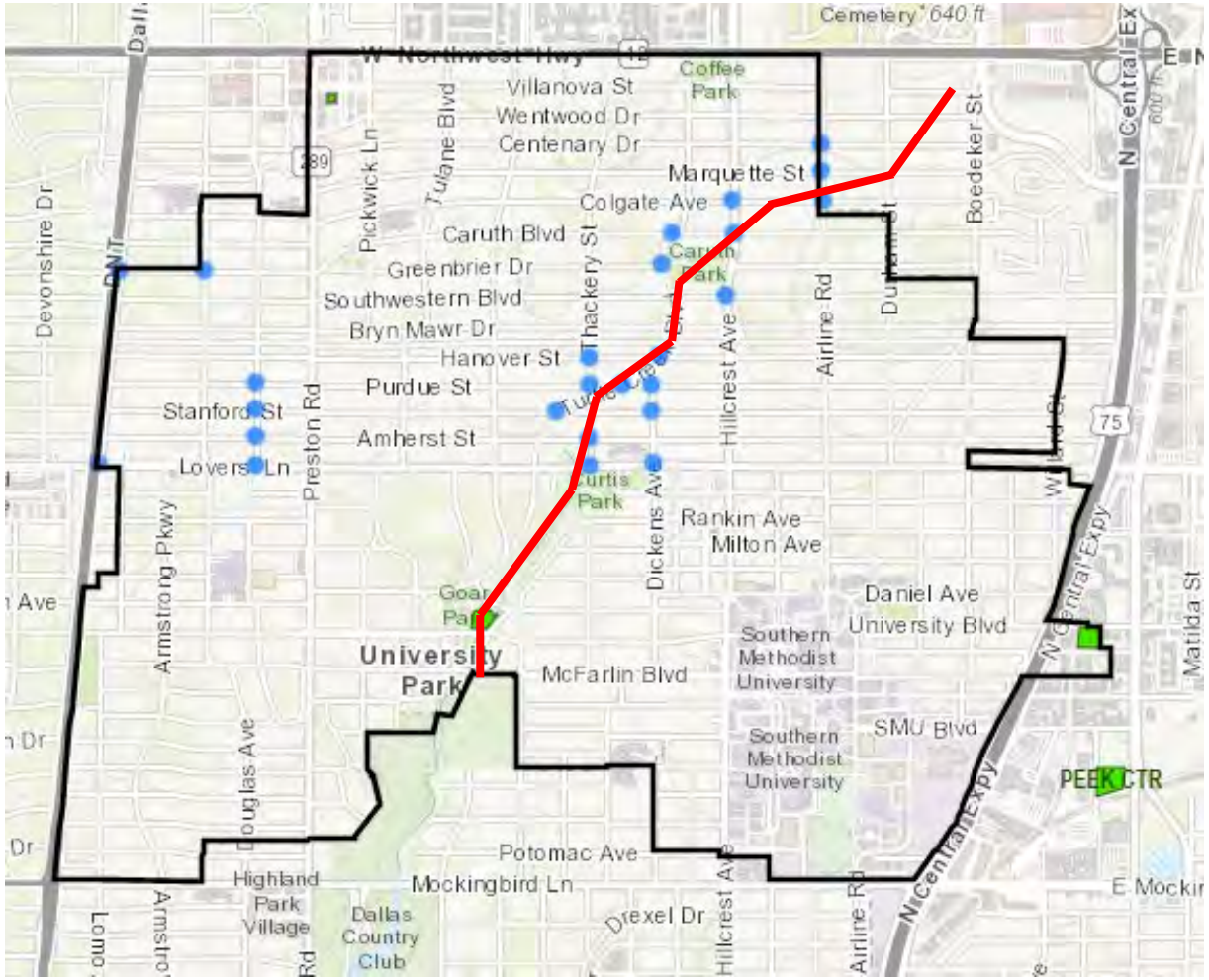
City Drainage Overview



City Drainage Overview

- The City's stormwater systems were installed as the City was initially developed between 1925 and 1955, including the existing ponds;
- The stormwater system mainly exists as it was originally installed. No significant upgrades have been made in the last 65+ years;
- Approximately 50% of all rain events exceed the capacity of our stormwater system today;
- Once the pipes are full, the remaining water flows overland and collects along low-lying areas.

City Drainage Overview



Community Needs

- Reduce impact of high-water events and loss of life
- Maintain serviceability of Parks and streets
- Minimize construction impacts to residents
- Reduce schedule as much as possible
- Spread project costs over multiple funding years
  - Phased construction

Project Goals

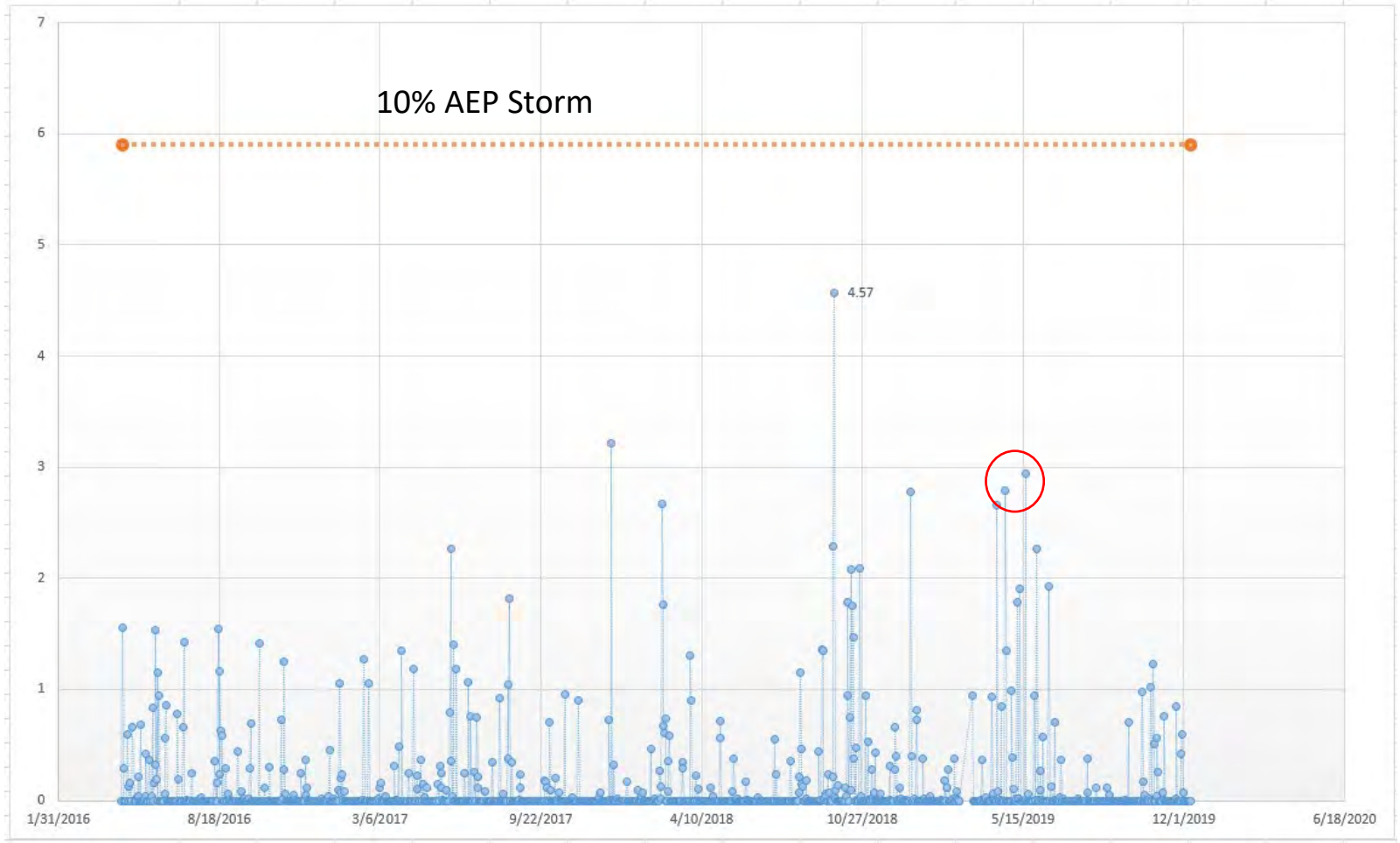
- Reduce flooding during major rain events
- Upsize system where needed while maintaining current release rates downstream to the Town of Highland Park
- Maximize detention volume
- Utilize City Parks and wider rights-of-way as part of the solution

Project Goals

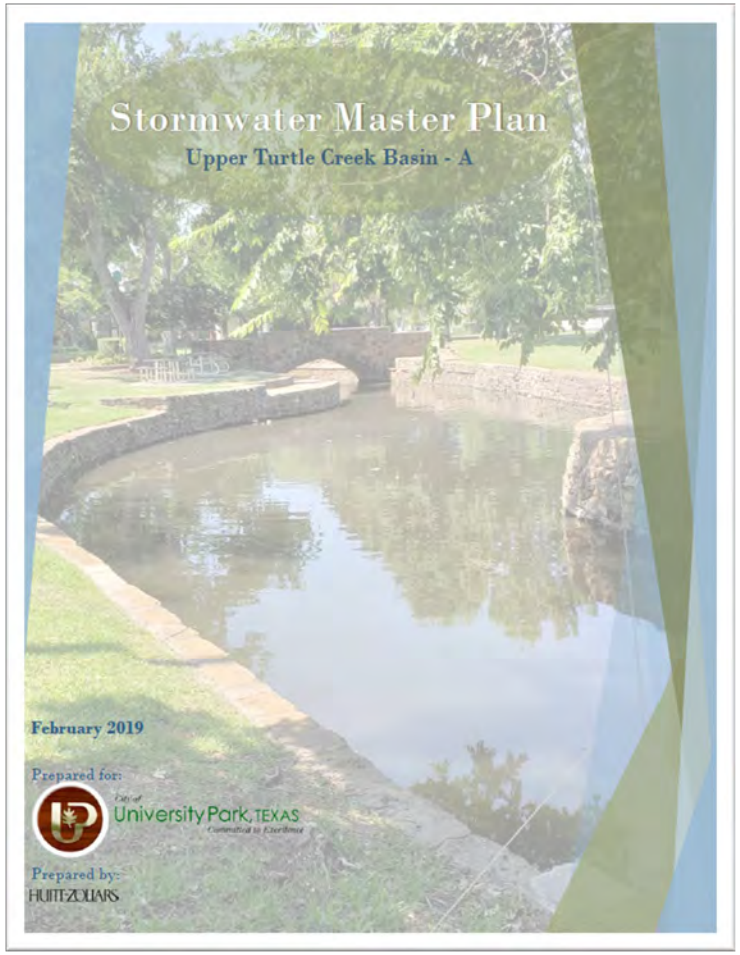
May 18, 2019

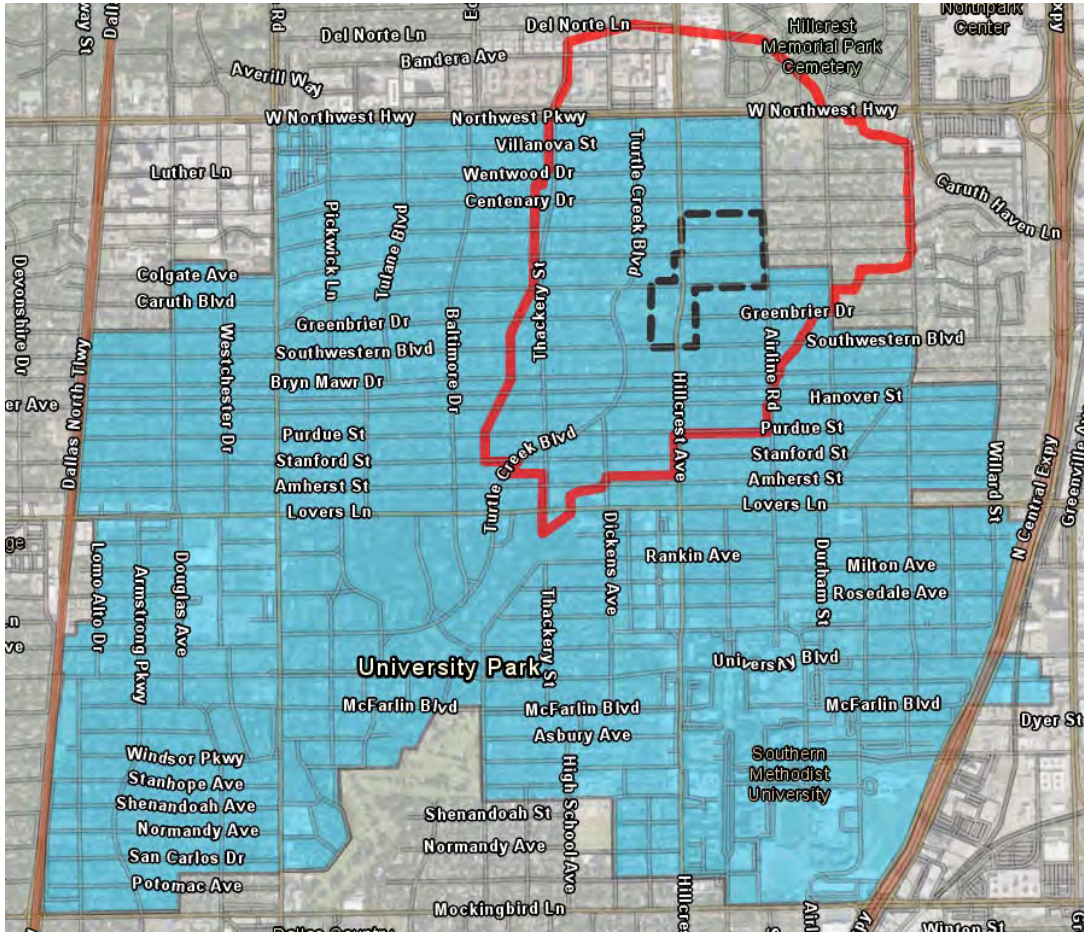
March 20, 2021

Water-My-Yard Data

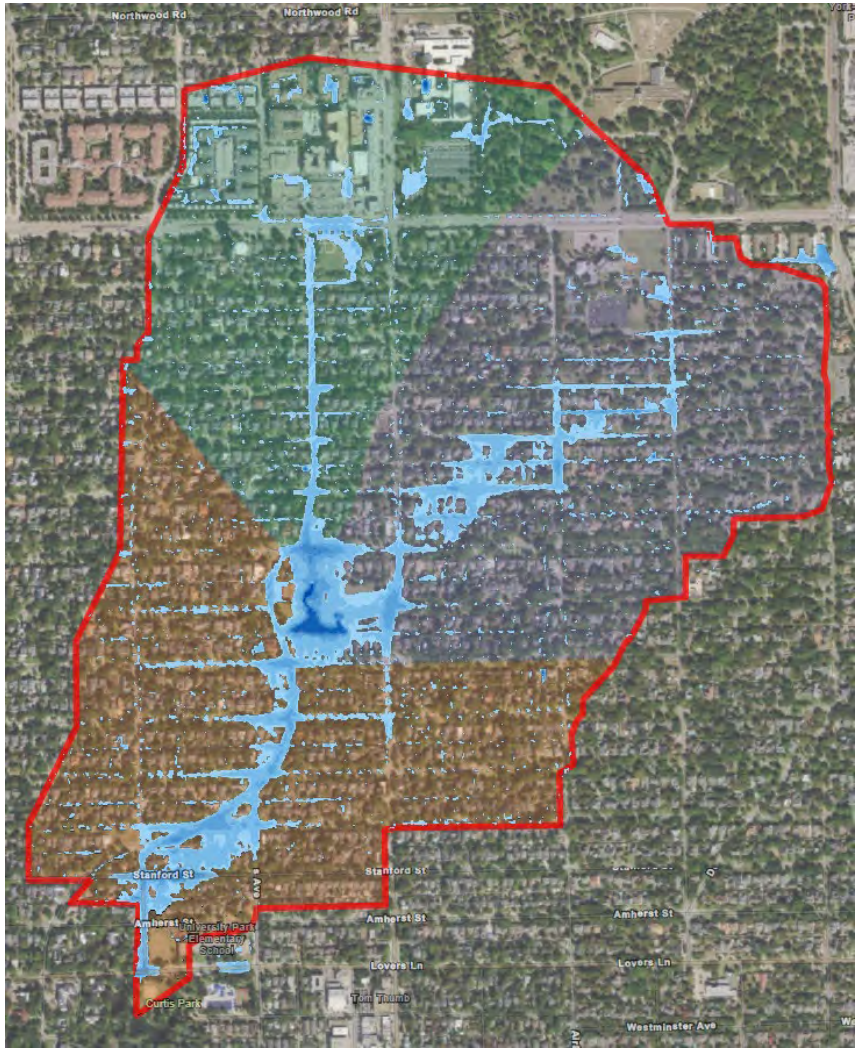


Stormwater Master Plan

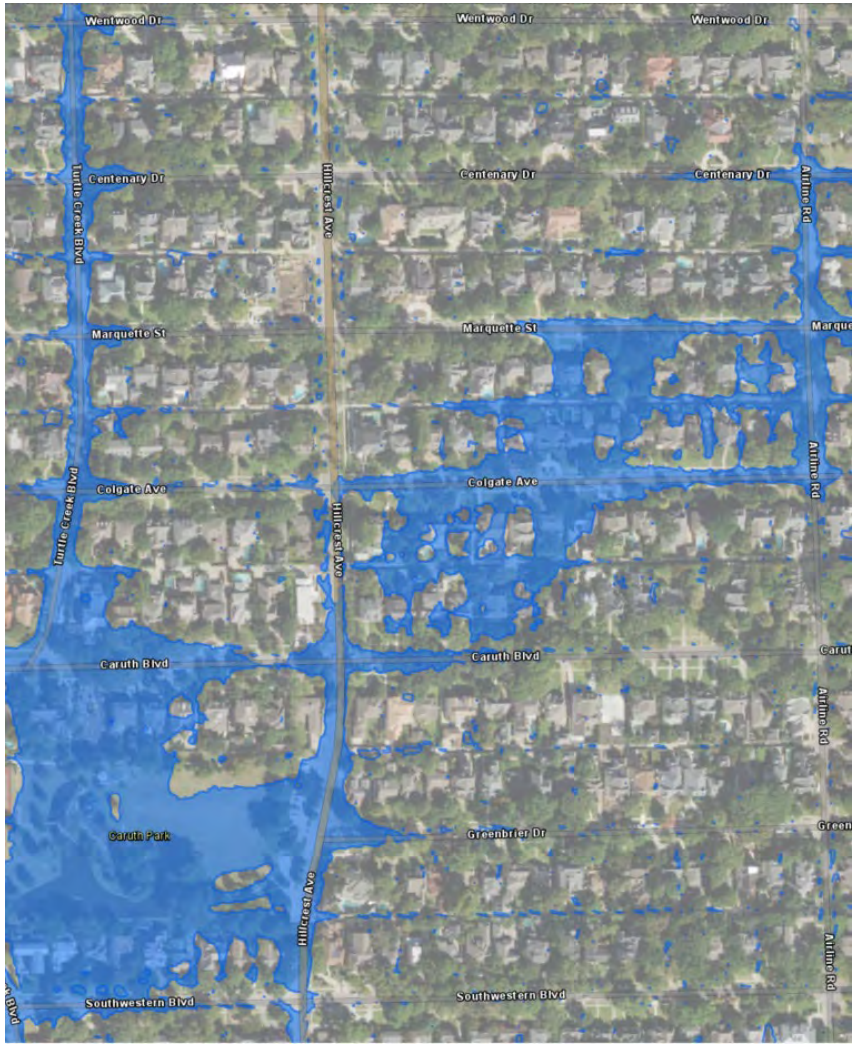




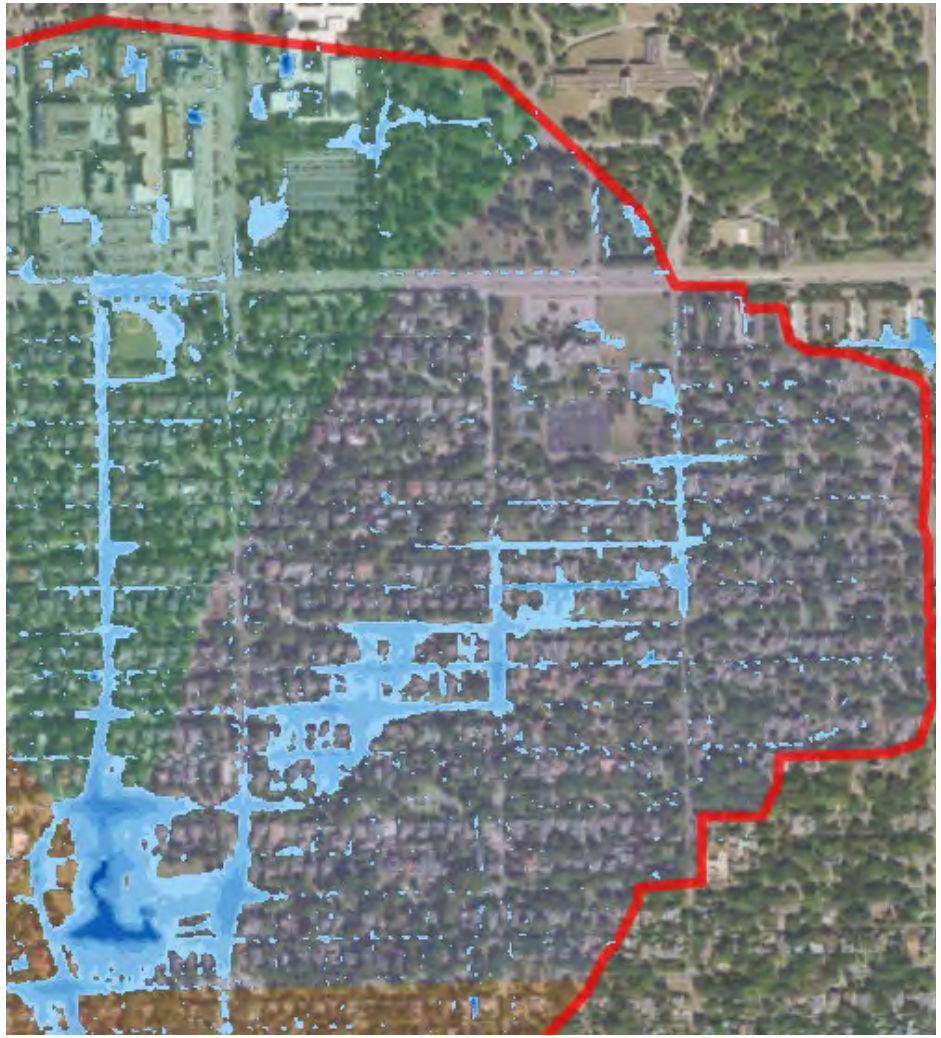
Stormwater Master Plan

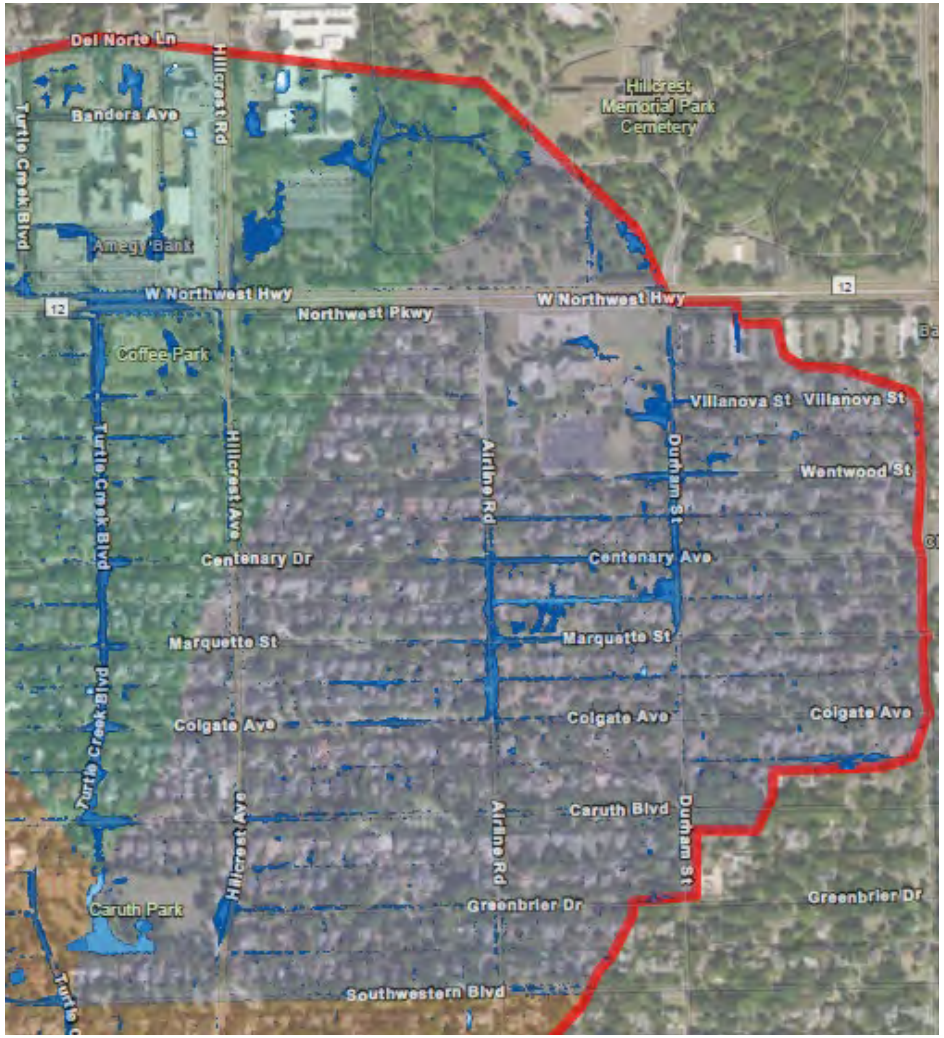


Stormwater Master Plan

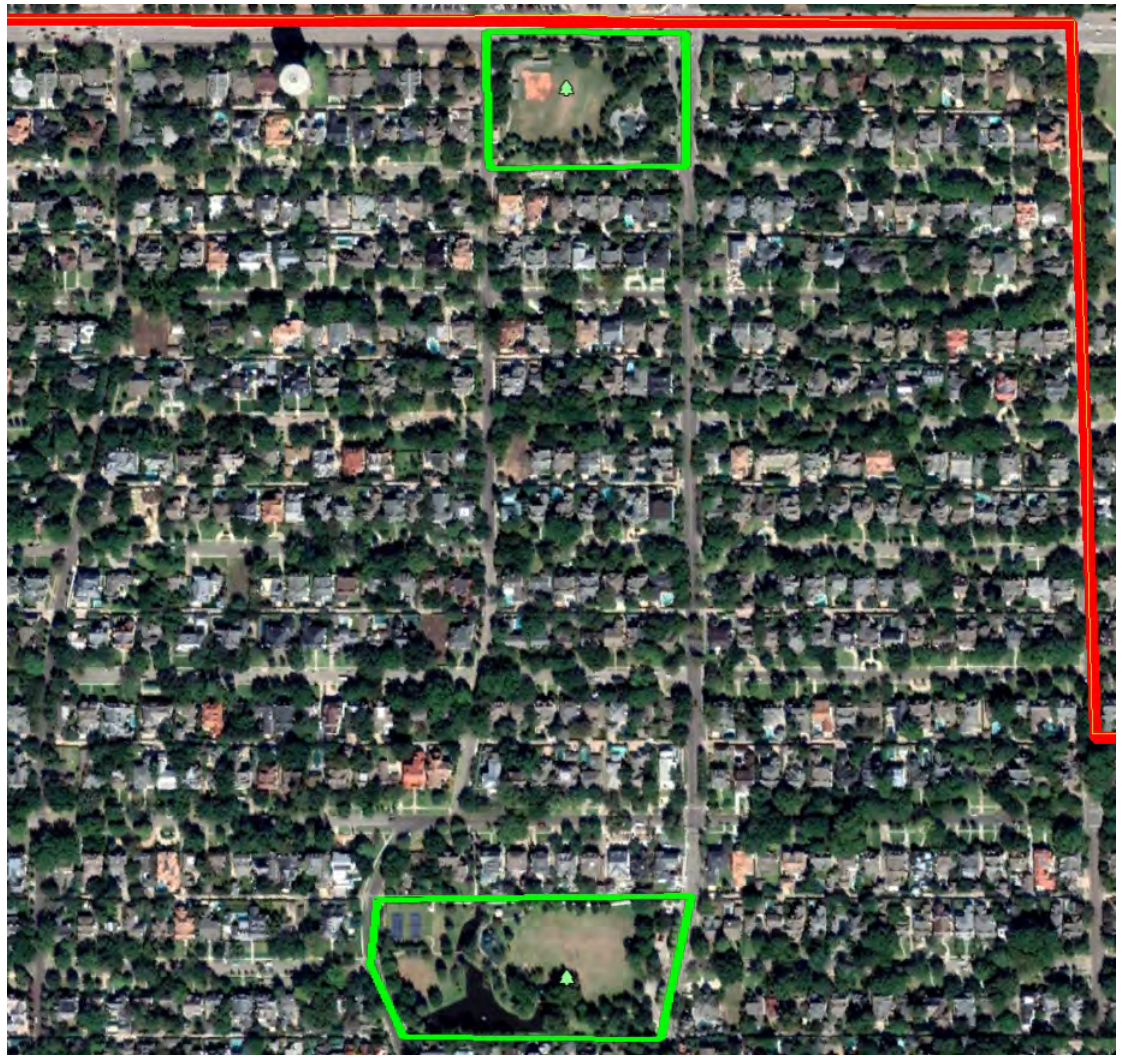


Stormwater Master Plan

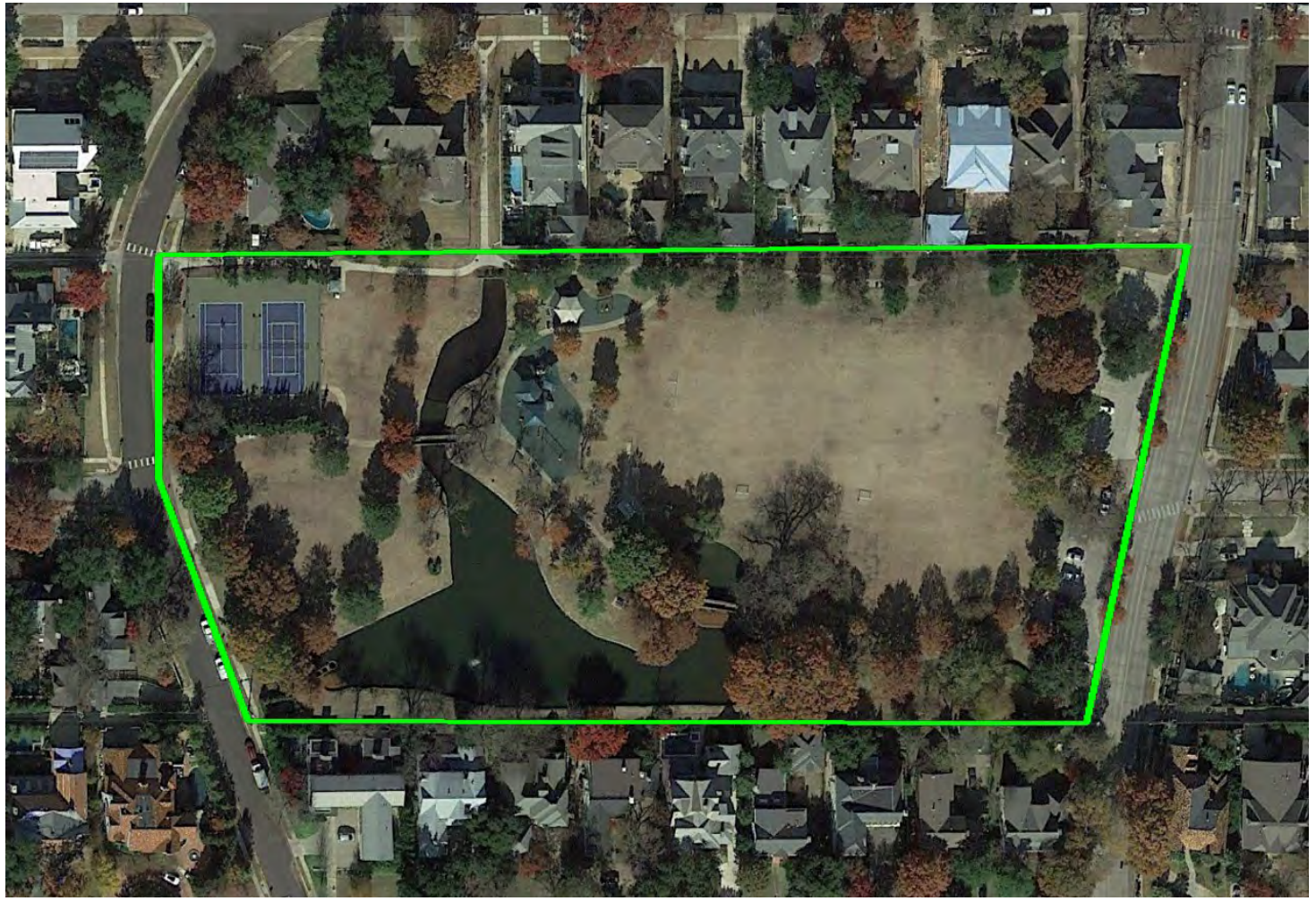




Mitigation Solutions - Aboveground



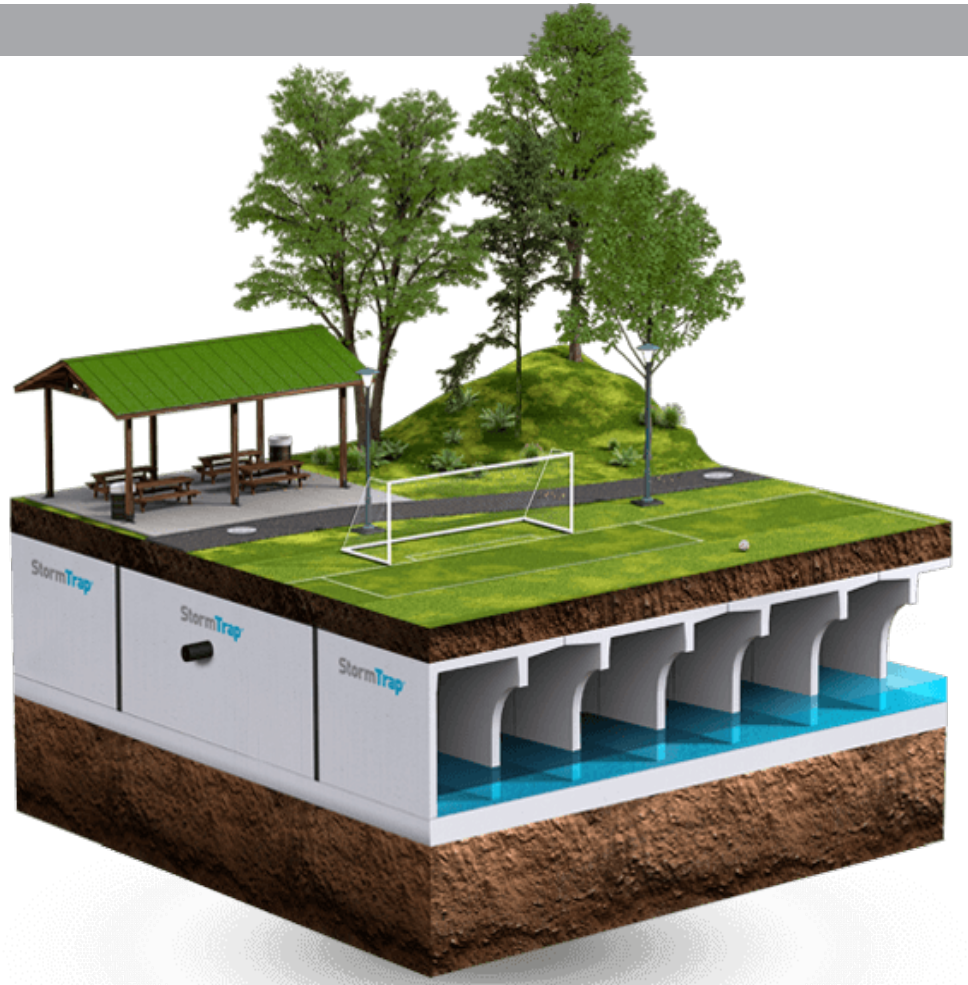
Mitigation Solutions - Aboveground



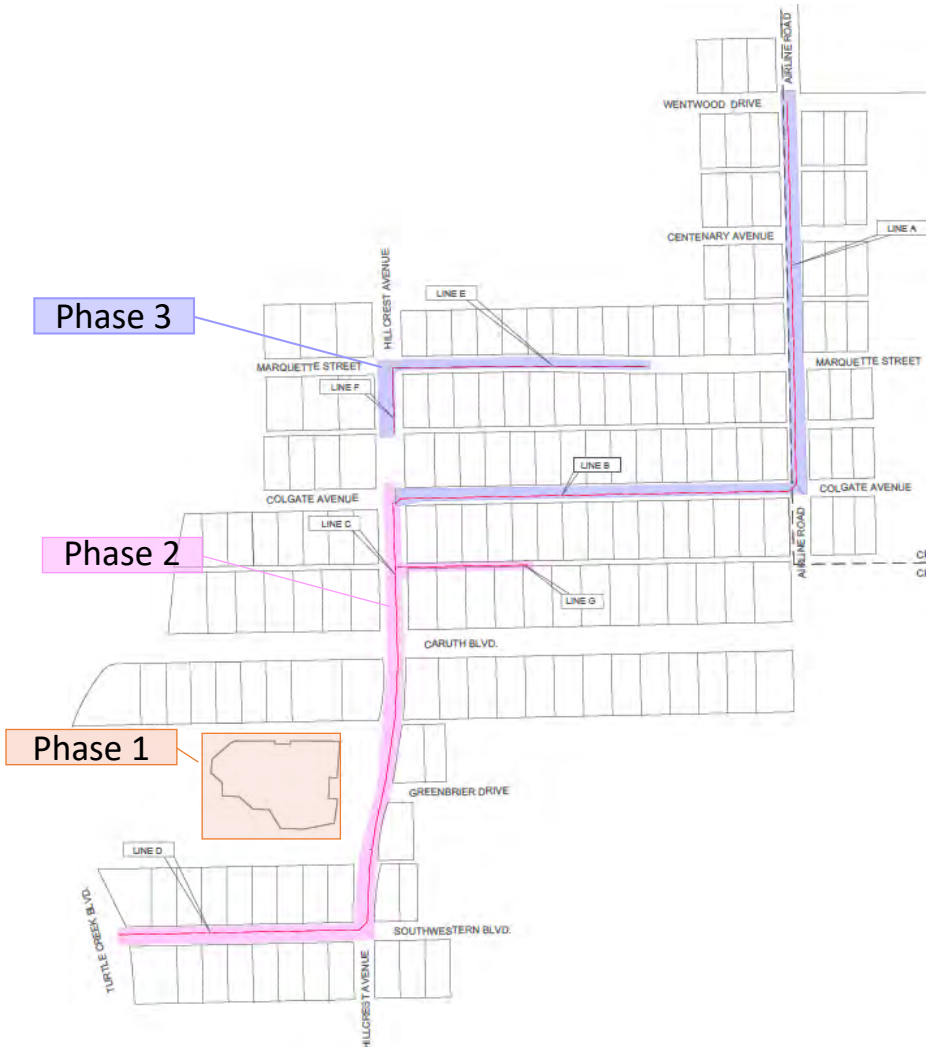
Mitigation Solutions - Underground

Mitigation Solutions - Underground

- Corrugated metal/plastic pipes
  - Limited storage
- Plastic Chambers
  - Limited storage
- Concrete Chambers
  - Fairly new with limited installations



Advanced Project Area – AOI 1



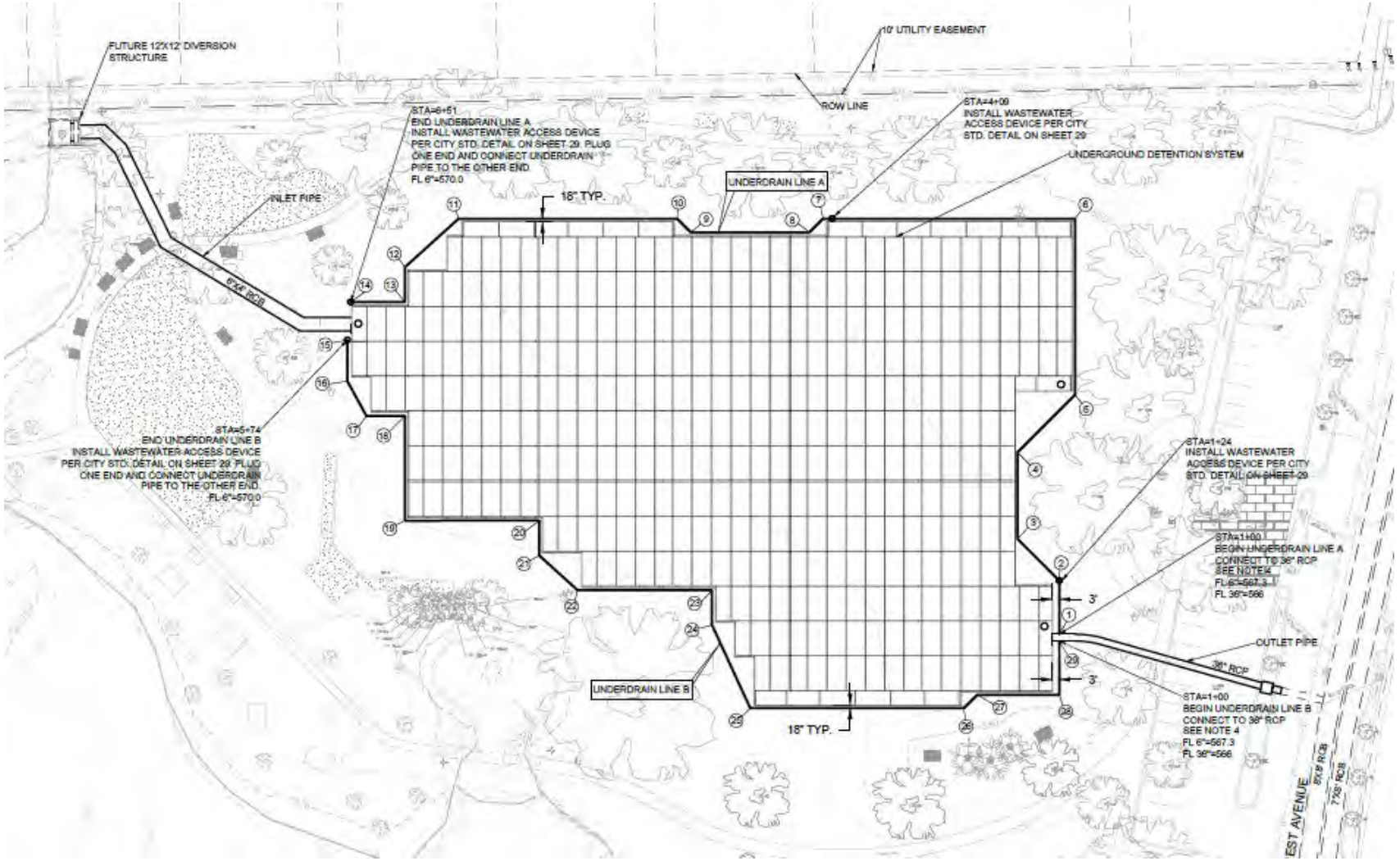
Construction Plans Development

Key Design Aspects

- Maximize Storage Within Available Footprint
- Water Table and Buoyancy
- Foundation and Backfill Material
- Maintenance

Construction Challenges

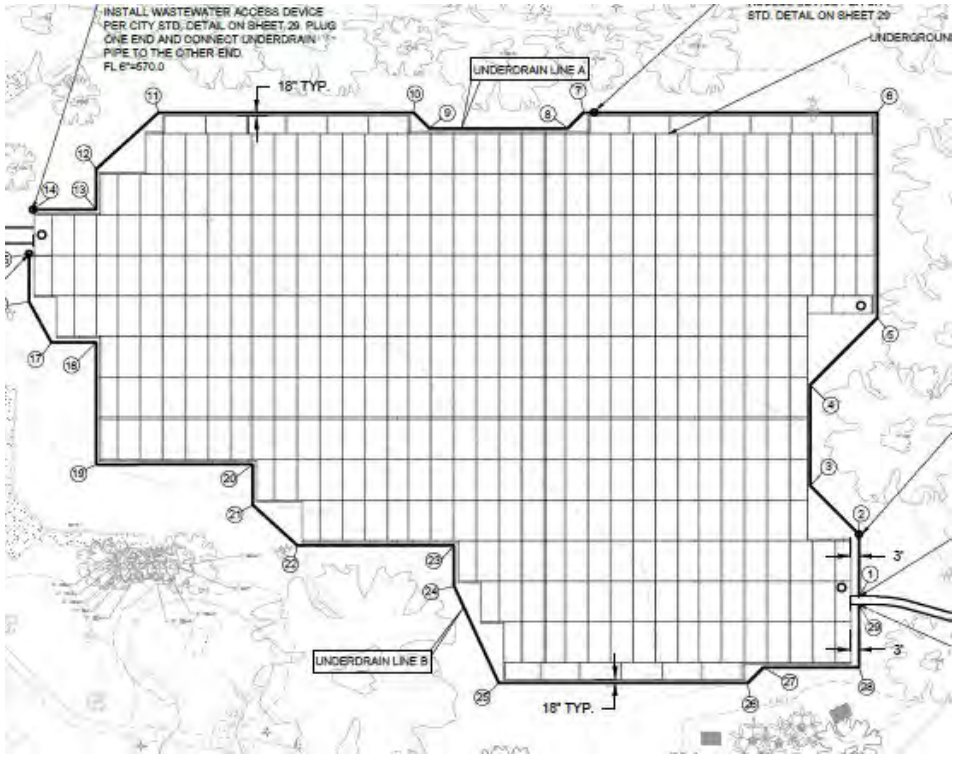
Construction Plan Development

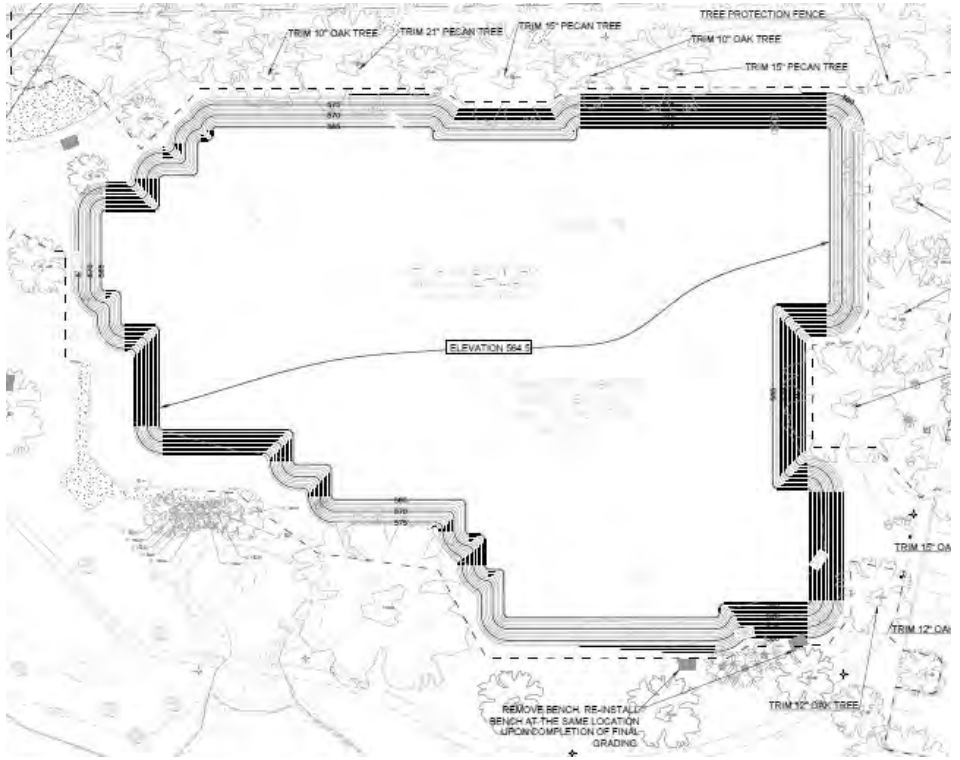


Construction Plans Development

Maximize Storage Within Available Footprint

- Extend excavation to edge of tree canopies
- Lower downstream receiving storm drain





Construction Plans Development

Construction Plans Development

Water Table and Buoyancy

- Four Geotechnical borings to determine sub-surface strata
- Two borings with monitored wells to determine height of WT
- Shallow Water Table encountered - 5-ft to 6-ft below surface

Construction Plans Development

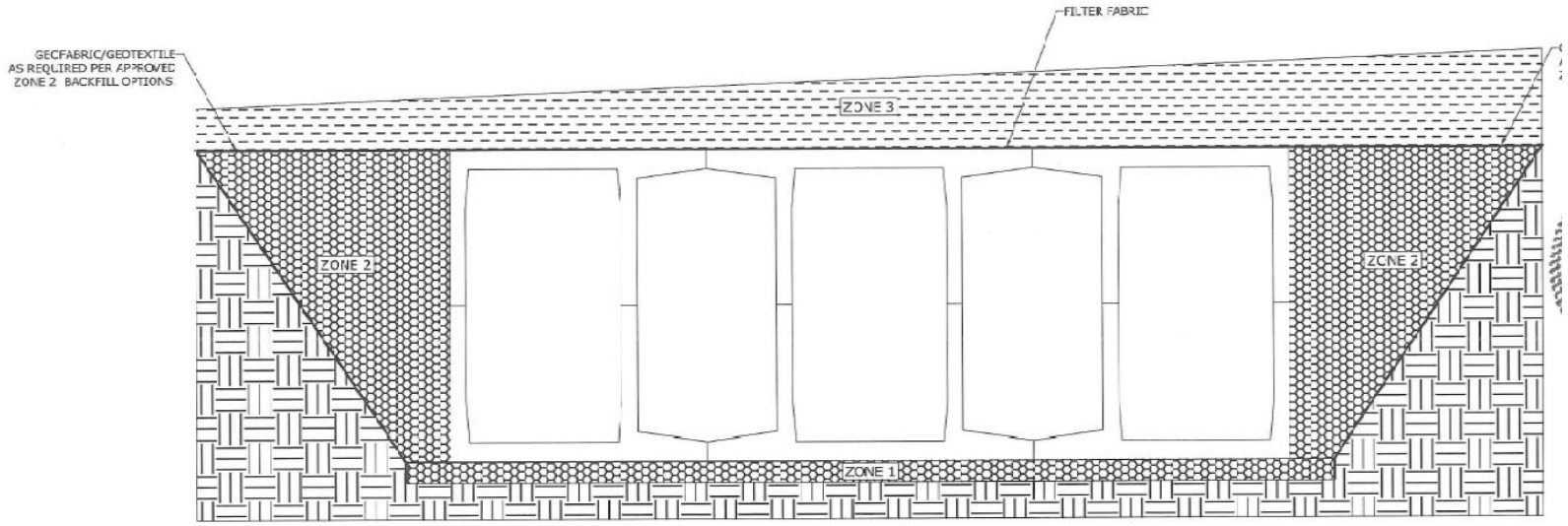
Underdrain used to address potential uplifting

- 6-in perforated PVC pipe around perimeter, at unit mid height
- Underdrain connected to downstream outfall pipe
- No filter fabric installed to prevent clogging
- Ability to flush the line clean using access devices

Construction Plans Development

Foundation and Backfill Material

- 6-in leveling pad of 5/8-in stone aggregate
- Backfill of 5/8-in stone aggregate
- Geotextile to prevent soil migration

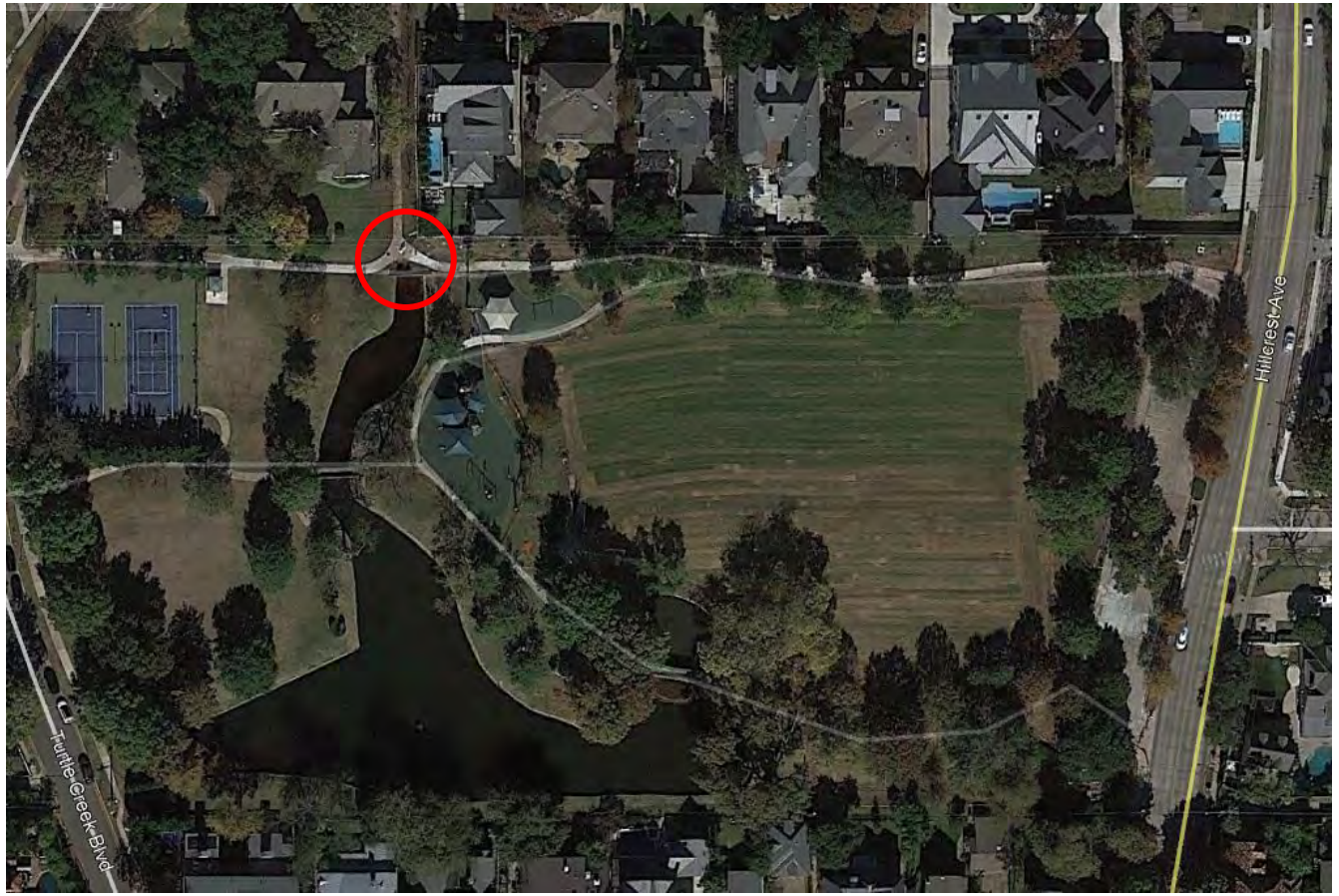


BACKFILL DETAIL

Construction Plans Development

Construction Plans Development

Post-Construction aerial image – First Flush Going To Existing Surface Pond



Construction Plans Development

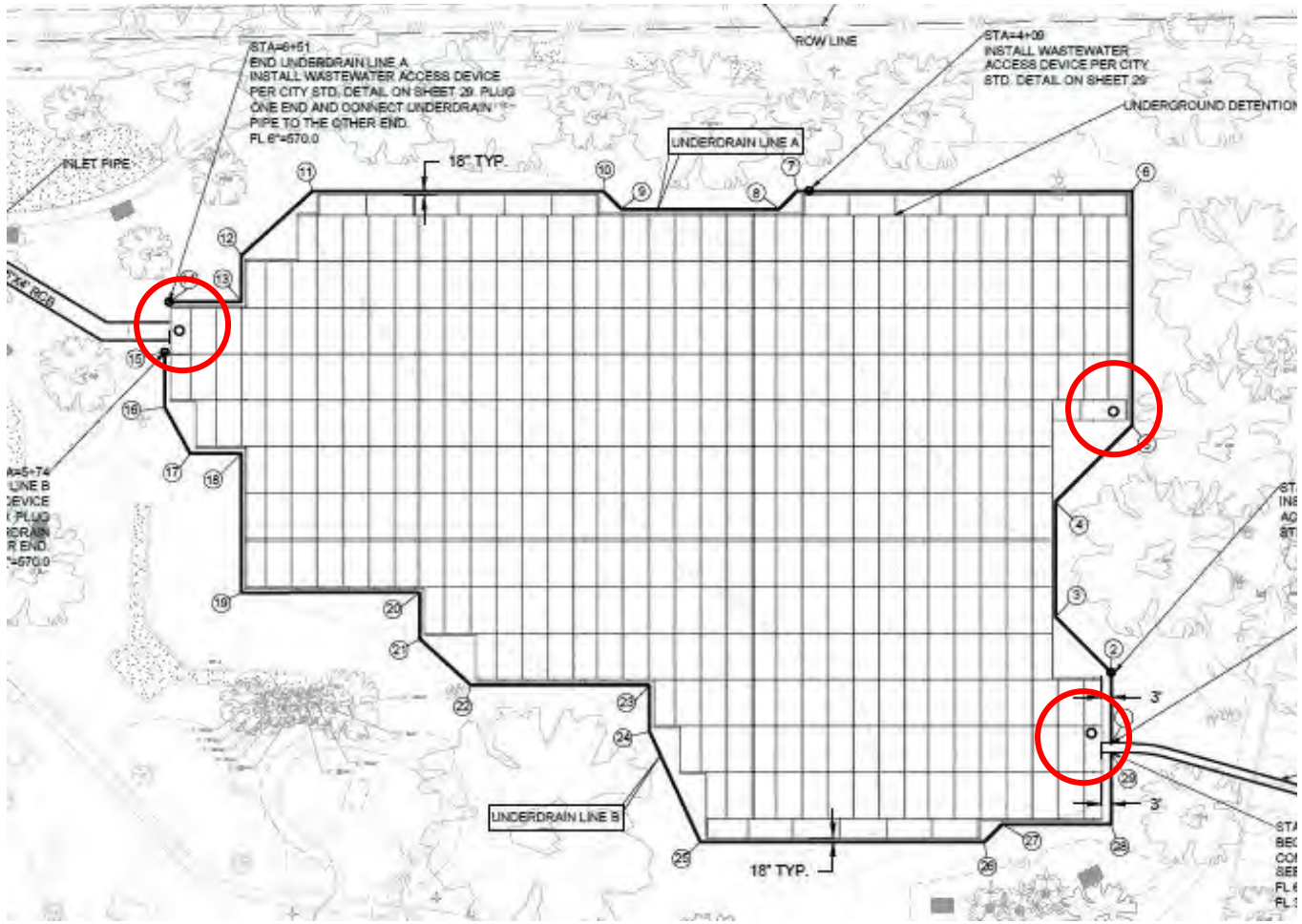
Maintenance

- Nearly maintenance free
- First flush to detention pond

Construction Plans Development

Maintenance

- Access risers



Construction Plans Development

Maintenance

- Access devices to flush underdrain

Construction Phase

Numbers

- 30,000 CY / 2,500 truck loads of haul off material

Construction Phase

Numbers

- 788 units
- 250 truck loads of StormTrap units

Construction Phase

Numbers

- 788 units
- 250 truck loads of StormTrap units

Construction Phase

Site Access

- Dedicated entrance and dedicated exit
- Specific Haul Route

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Construction Phase

Site Access

- Dedicated entrance and dedicated exit
- Specific Haul Route

Construction Challenges

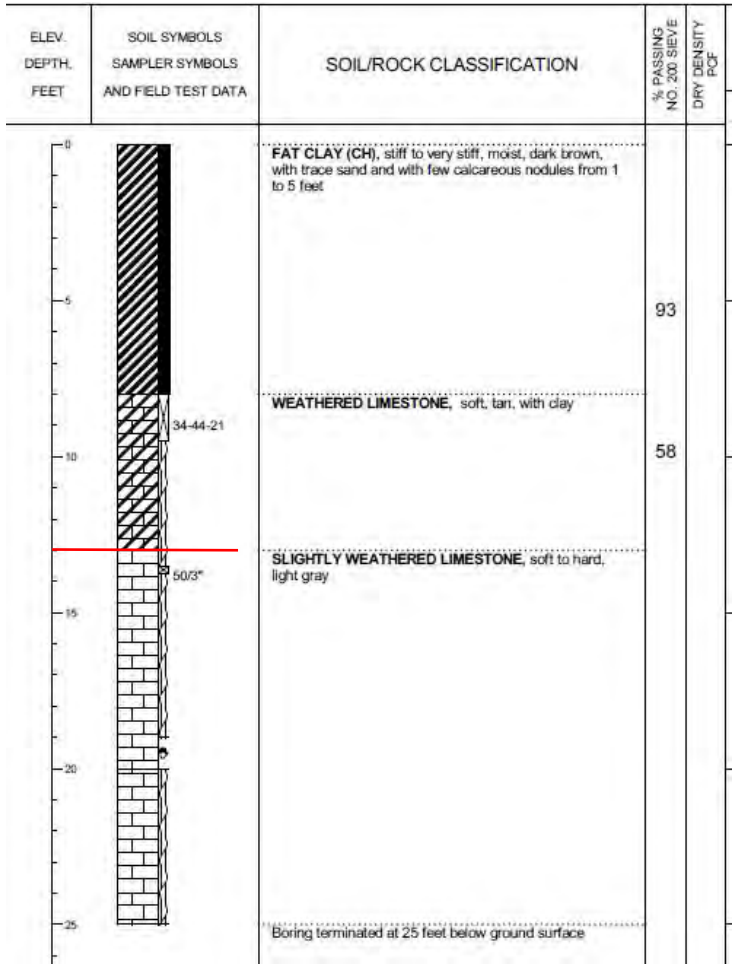
- Control of Water
- Excavation Into Hard Rock

Construction Challenges

Pumped Water Treated Before Reaching Storm Drain

Water Diverted Around Perimeter And Pumped to Upper Surface

Construction Challenges



Grey Limestone Encountered
13’ Below Surface

Construction Challenges

Construction Phase

Construction Phase

Construction Phase

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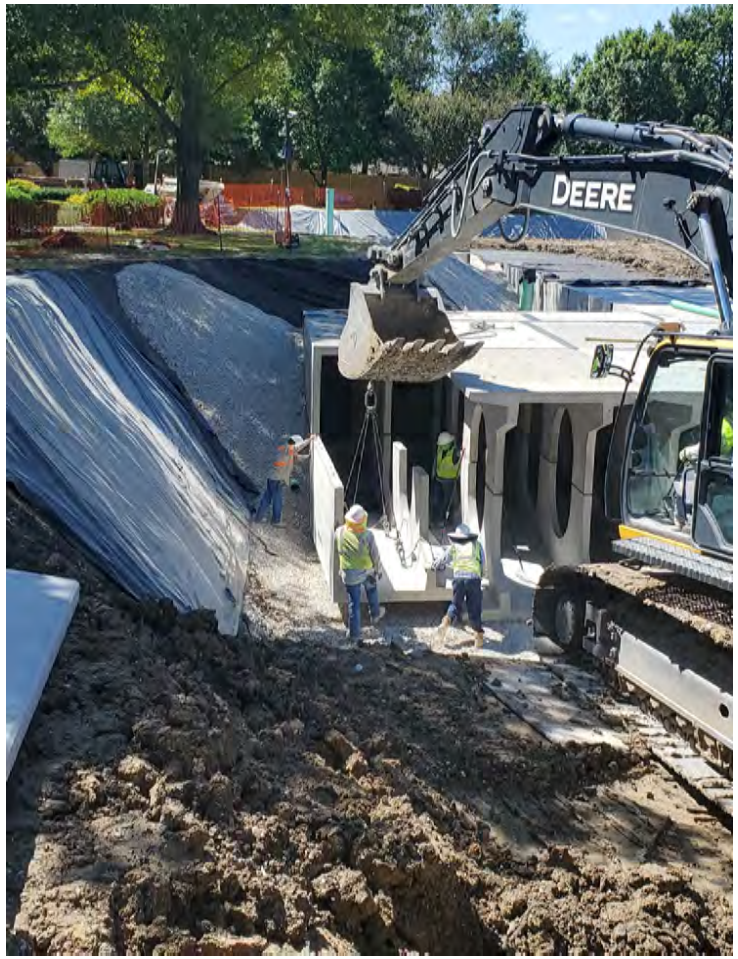

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Construction Phase

Key Steps to Success (City Perspective)

- Procuring material before Contractor award to keep project on schedule
- Established truck-routes to mitigate traffic concerns
- Public Meetings in advance of project to establish resident expectations
- Continued involvement with the Parks Department on process and construction mitigation
  - Design input from beginning
  - Tree mitigation during pre-construction assured survival during and post-construction

Project Completion

May 2020

Project Completion

May 2021

Project Completion

- Time-lapse video

Questions and Answers with:

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City Engineer
City of University Park

Hamilton Dallagasperina, PE, CFM
Project Manager
Huitt-Zollars

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Todd Danielson
Editorial Director
Informed Infrastructure

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